

REMARKS

Applicants respectfully request reconsideration of the present application in view of the reasons that follow.

A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with appropriate status identifiers.

Response to Arguments

On pages 6-7 of the Office Action, the Examiner states:

Applicant argues that Edelstein *et al.* do not teach the claimed limitation of "at least one element for increasing grain size including Calcium (Ca) or Chromium (Cr)" because Bogel *et al.*, which was cited as supporting evidence that the inclusion of Calcium (Ca) or Chromium (Cr) increases the grain size, merely states that "FIG. 3 graphically illustrates the effect of solution annealing (SA) time and temperature on the recrystallization and grain growth for a copper alloy having 0.40% chromium."

Although Edelstein *et al.* do not explicitly state that said at least one element increases the grain size, the claimed limitation of "at least one element for increasing grain size including Calcium (Ca) or Chromium (Cr)" is inherent in Edelstein *et al.*'s device, because it is known in the art that the inclusion of Calcium (Ca) or Chromium (Cr) increases the grain size. Bogel *et al.* is merely cited as supporting evidence that the inclusion of Calcium (Ca) or Chromium (Cr) increases the grain size (column 7, lines 65-67).

Applicants respectfully disagree.

MPEP 2112 states:

"In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." *Ex parte* Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original).

The Examiner has not met the burden of proof required to show inherency. As Applicants have stated in previous responses, the Examiner has only made the conclusory statement: “it is known in the art that the inclusion of Calcium and Chromium (Cr) increases grain size.” The Examiner has not provided “a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art,” as required by MPEP 2112, quoted above.

Edelstein et al. does not describe grain size, increasing grain size, an element increasing grain size, or improving electromigration. MPEP 2131.01 states that an extra reference or evidence can be used to show an “inherent characteristic of the thing taught by the primary reference.” However, in this situation, Edelstein et al. does not teach *anything* about grain size or improving electromigration characteristics. There cannot be an “inherent characteristic of the thing taught by the primary reference” if the primary reference (Edelstein et al.) does not teach the “thing” at all, which is improving electromigration by increasing grain size.

Bögel et al. does not provide the teachings or support missing from Edelstein et al. The Examiner states that “Bogel et al. is merely cited as supporting evidence that the inclusion of Calcium (Ca) or Chromium (Cr) increases the grain size.” However, Bögel et al. fails as “supporting evidence.” First, Bögel et al. does not “support” any other evidence because the Examiner has not given any evidence except the Examiner’s own conclusion that Calcium (Ca) or Chromium (Cr) increases the grain size. Second, Bögel et al. is in a completely different technology. Bögel et al. specifically states that its invention is directed to “under the hood **automotive** applications” (Col. 4, lines 60-61, emphasis added.) In the “Description of Related Art,” Bögel et al. lists “leadframes, wires, tubes” and other items as products including copper alloys. (See Col. 1, lines 24-25.) Edelstein et al. relates to the “technology of making interconnections to provide for vias, lines, and other recesses in semiconductor chip structures” (Background of the Invention, col. 1, lines 20-22.) Third, Bögel et al. does not even support the proposition that Chromium (Cr) increases the grain size. The Examiner cites to col. 7, lines 65-67 of Bögel et al., which states:

FIG. 3 graphically illustrates the effect of solution annealing (SA) time and temperature on the recrystallization and grain growth for a copper alloy having 0.40% chromium.

This language in Bögel et al. describes change in grain growth due to *annealing time* and *temperature*, not by the addition of an element. There is no causation taught or suggested that including Calcium (Ca) or Chromium (Cr) increases grain size. It is simply wrong to say that Bögel et al. is evidence “that the inclusion of Calcium (Ca) or Chromium (Cr) increases the grain size,” as the Examiner suggests.

Rejections Under 35 U.S.C. § 102

In the Office Action, Claims 1-3, 6, 10, 15, 17-20 and 22 are rejected under 35 U.S.C. § 102(e) as anticipated by U.S. Patent No. 6,399,496 (Edelstein et al.) as supported by U.S. Patent 6,749,689 (Bögel et al.). Applicants respectfully traverse the rejection.

Independent Claim 1 requires:

the copper alloy material including Zinc (Zn) or Silver (Ag) and at least one element for increasing grain size including Calcium (Ca) or Chromium (Cr).

(Underlining added.) Independent claims 10 and 17 require:

the ternary copper alloy via material includes an element with a characteristic for increasing grain size of the ternary copper alloy via,

(Underlining added.) As discussed above, Edelstein et al. does not teach or suggest depositing a copper alloy material with an element for increasing grain size. Bögel et al. teaches increasing grain size by annealing (i.e., increasing temperature). Bögel et al. does not teach or suggest certain elements that increase grain size.

Without evidentiary support showing the claimed limitations in Applicants’ claims, the rejection of Claims 1-3, 6, 10, 15, 17-20 and 22 under 35 U.S.C. § 102(e) cannot be properly maintained. Applicants respectfully request withdrawal of the rejection.

Rejections Under 35 U.S.C. § 103

In the Office Action, Claims 8, 13, and 16 are rejected under 35 U.S.C. § 103(a) over Edelstein et al. in view of Bögel et al. Claim 4 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Edelstein et al. and Bögel et al. and further in view of U.S. Patent No. 6,440,849 (Merchant et al.). Claims 9 and 23 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Edelstein et al. and Bögel et al. and further in view of U.S. Patent No. 6,380,083 (Gross). Claims 11-12 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Edelstein et al. and Bögel et al. and further in view of U.S. Patent No. 6,090,710 (Andricacos et al.). Applicants traverse all of these rejections.

Claims 4, 8-9, 12-13, 16, and 23 all depend in some way from independent claims 1, 10 and 17. As explained above, the combination of Edelstein et al. in view of Bögel et al. does not teach or suggest all of the limitations in the independent claims. To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art (see M.P.E.P. § 2143.03).

Further, there is no showing of a motivation or suggestion to one of ordinary skill in the art to combine the teachings as the Examiner has attempted to do. On page 4 of the Office Action, the Examiner states that “it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use Calcium (Ca) or Chromium (Cr) ... to provide a stable Cu alloy with improved electromigration properties.” However, as explained above, Bögel et al. does not use Calcium (Ca) or Chromium (Cr) to change grain growth and thereby improve electromigration properties. Rather, the grain growth is a result of solution annealing time and temperature. (See Bögel et al. Col. 7, lines 65-67.)

For at least the foregoing reasons, Applicants respectfully request withdrawal of the rejections based on the combination of the above-mentioned references.

Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

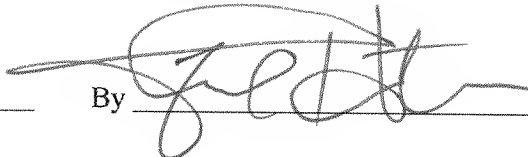
The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a credit card payment being in the wrong amount, post-dated, otherwise improper or informal, or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extension of time is needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date August 3, 2007

By

A handwritten signature in dark ink, appearing to read 'Paul S. Hunter', is written over a horizontal line.

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